MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH UNIVERSITYAKLI MOHAND OULHADJ–BOUIRA
FACULTY OF NATURAL AND LIFE SCIENCES AND EARTH SCIENCES DEPARTMENT OF BIOLOGY

Ref : ……/UAMOB/FSNVST/2024

Dissertation

OVERVIEW OF OBTAINING THE DIPLOMASTER

Domain : SNV **Sector** : Ecology and environment

Speciality : Biodiversity and Environment

Presented by :

MOUSSI Selma & BELGHIT Chaima

Theme

Study of the biology of some fish species (Bouira)

Supported on : 24/06/2024 **Before the jury composed of :**

First and last name	*Grade*		
Mr. ARAB Amar	*MCA*	*Univ.from Bouira*	*President*
Mrs. IDER Djamila	*MCB*	*Univ. from Bouira*	*Promoter*
Mrs. LAMRI Naziha	*MCA*	*Univ. from Bouira*	*Examiner*

Academic Year : 2023/2024

Thanks

At the end of this work, we would first like to thank Allah the Almighty, who gave us the health, strength and patience to perform this work to complete our Master's training.

We would like to warmly thank Mrs **IDER Djamila** for her guidance, her wise guidance, and her contribution to the success of this work.

Our sincere thanks also go to the members of the jury for their interest in our research by agreeing to examine our work and enrich it with their remarks.

We want to thank Mr **ARAB Amar** for agreeing to chair the jury.

We also thank Mrs **LAMRI Naziha** for agreeing to review this work.

Finally, we would like to express our gratitude to all the people who contributed greatly to its success.

Dedication

I dedicate this modest work :

To my dearest parents

To my dear brothers and sister

To all the family

To my dear friends

Dear buddy

To you dear reader

Selma

Dedication

I dedicate this modest work :

To my dearest parents

To my dear brother and sisters

To all the family

To my dear friends

Dear buddy

To you dear reader

Chaima

Summary

Summary

List of Figures

List of Figures

List of tables

List of tables

Introduction

Introduction

Water plays an important role in the world, it is a source of life for all species, (Vu, 2008).

Fish is one of the most studied vertebrate species as it is of great ecological and economic importance (Salhi 2022). More than 28,000 species are identified, classified as freshwater and seawater fish (Sebastien., 2011).

Algeria has been affected by the introduction of new fish species. According to Brahmia (2016), it is for the purpose of promoting aquaculture (carp, tilapia...) ; some introductions also aim to occupy ecological niches and water bodies poor in fish.

Work on freshwater ichthyofauna in Algeria has not been as developed as for marine ecosystems. Available studies focus mainly on species classification and rarely on their environment or geographical distribution (Almaça, 1969 ; Penczak and Molinski, 1984 ; Bouhaddad, 1993 ; Bouhadad and Asselah, 1998). Few authors have been interested in the study of reproduction and growth (Arab, 1989 ; Djoudad-Kadji *et al*., 2012 ; Attal and Arab, 2013 ; Djoudad-Kadji, 2014 ; Mimeche *et al*, 2015).

The objective of our work is to provide more information on the biology of deferential freshwater fish species inhabiting different freshwater bodies of the wilaya de Bouira (Talesdit dam, Oued Lakhel and Oued Isser dam).

Our work focuses on :

• Bibliographic summary of general information on freshwater fish ;

• Description of equipment and methods used ;

• Exposure and discussion of results ;

• A conclusion.

Chapter 01 : Bibliographic Synthesis

Chapter 01 : Bibliographic Synthesis

I. General information on fish

I.1. Definition of Fish

Fish are aquatic animals with gill respiration (Ould Mokhtar, 2020). Approximately 24,500 species are recognized due to various morphological, anatomical and physiological characteristics (Morsi 2016).

I.2. Fish classification

Today the fish are divided into: The Chondrichthyens (cartilaginous fishes) and the Osteichthyes (bony fishes) (Boudjenane and Safa, 2019).

A. Cartilaginous fish

Sharks and rays are made up of a fully cartilaginous skeleton (Oumar, 2015).

B. Bony fish

Several groups of bony fish are grouped together. These are vertebrates with a more or less bony skeleton and a symmetrical caudal fin (Oumar, 2015).

I.3. Fish morphology

Fish are animals that breathe underwater thanks to their gills. Their entire body is covered with scales and it moves by moving its fins (fig.1) (Morsi, 2016)

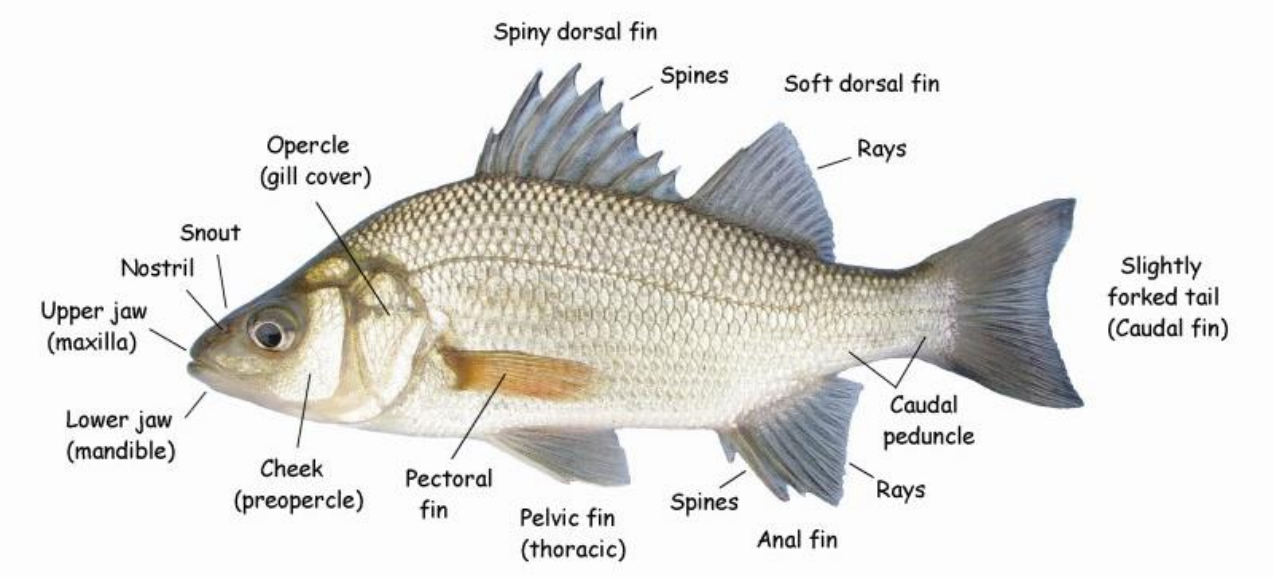

Figure 1 : Fish morphology (Anonymous 1)

II. Freshwater fish

Includes all species that spend at least part of their life cycle in freshwater for growth and/or reproduction (Boudjenane and Safa, 2019).

II.1. The main freshwater species in Algeria

The ichthyofauna has been recorded with 67 species divided into 27 families and 45 genera. They include 47 native species, 6 endemics to North Africa and 20 introduced. The Cyprinidae family (11 genera and 18 species) is the largest in Algeria, followed by the Cichlidae (5 genera and 8 species) and the Mugilidae (3 genera and 5 species). The other families consist of only one or two species (Lounaci 2012).

Table 1: List of freshwater fishes in Algeria (Lounaci, 2012)

Familles	**Espèces**
Cyprinidae	*Alburnus alburnus* (Linneaus, 1758)
	Aristichtys nobilis (Richardson, 1845)
	Barbus amguidensis (Pellegrin, 1934)
	Barbus biscarensis (Boulanger, 1911)
	Barbus callensis (Valencienne,
	Barbus deserti (Pellegrin, 1909)
	Barbus meridionalis (Risso, 1827)
	Barbus moulouyensis (Pellegrin, 1924)
	Barbus setivimensis (Valenciennes, 1842)
	Carassius auratus (Linneaus, 1758)
	Ctenopharyngodon idellus (Valenciennes, 1844)
	Cyprinus carpio carpio (Linné, 1758)
	Hypophtalmichthys molitrix (Valenciennes, 1844)
	Pseudorasbora parva (Schlegel, 1842)
	Pseudophoxinus callensis (Guichenot, 1850)
	pseudophoxinus punicus (Pellegrin, 1920)
	Scardinius erythrophthalmus (Linné, 1758)
	Tinca tinca (linnaeus, 1758)
Cichlidae	*Haplochromis desfontainii* (Lacépède, 1802)
	Hemichromis bimaculatus (Gill, 1862)
	Hemichromis stellifer (Loiselle, 1979)

	Oreochromis macrochir macrochir (Boulanger, 1912)
	Oreochromis mossambicus (Peters, 1852)
	Oreochromis niloticus (Linnaeus, 1758)
	Sarotherodon borkuanus (Pellegrin, 1919)
	*Tilapia zillii (*Gervais, 1848)
Mugilidae	*Chelon labrosus* (Risso, 1827)
	Liza aurata (Risso, 1810)
	Liza ramada (Risso, 1810)
	Liza saliens (Risso, 1810)
	Mugil cephalus (Linné, 1758)
Cyprinodontidae	*Aphanius apodus* (Gervais, 1853)
	Aphanius fasciatus (Valenciennes, 1821)
	Aphanius iberus (Valenciennes, 1846)
	Aphanius saourensis (Blanco, Hrbek & Doadrio, 2006)
Atherinidae	*Atherina boyeri* (Risso, 1810)
	Atherina presbyter (Cuvier, 1829)
Carcharhinidae	*Carcharias limbatus* (Müller & Henle, 1839)
	Carcharias melanopterus (Gaymard, 1824)
Clariidae	*Clarias anguillaris* (Linnaeus, 1758)
	Clarias gariepinus (Burchell, 1822)
Clupeiidae	*Alosa alosa* (Linné, 1758)
	Alosa fallax (Lacepède, 1803)
Gasterosteidae	*Gasterosteus aculeatus aculeatus* (Linnaeus, 1758)
	Pomatoschistus pictus (Malm, 1865)
Labriidae	*Symphodus roissali* (Risso, 1810)
	Symphodus tinca (Linnaeus, 1758)
Moronidae	*Dicentrarchus labrax* (Linné, 1758)
	Dicentrarchus punctatus (Bloch, 1792)
Poecilliidae	*Gambusia affinis* (Baird et Girard 1853)
	Gambusia holbrooki (Girard, 1859)
Sciaenidae	*Salmo trutta macrostigma* (Duméril, 1858)
	Umbrina cirrosa (Linnaeus, 1758)
Acipenseridae	*Acipenser sturio* (Linneaus, 1758)

Alestiidae	*Brycinus macrolepidotus* (Valenciennes, 1850)
Anguillidae	*Anguilla anguilla* (Linné, 1758)
Blennidae	*Salaria fluviatilus* (Asso, 1801)
Centrarchidae	*Micropterus salmoides* (Lacepède, 1802)
Esocidae	*Esox lucius* (Linné, 1758)
Percidae	*Sander lucioperca* (Linné, 1758)
Petromyzontidae	*Petromyzon marinus* (Linnaeus, 1758)
Pleuronectidae	*Platichthys flesus* (Linnaeus, 1758)
Salmonidae	*Oncorhynchus mykiss* (Walbaum, 1792)
Siluridae	*Silurus glanis* (Linneaus, 1758)
Sphyraenidae	*Sphyraena viridensis* (Cuvier, 1829)
Syngnathidae	*Syngnathus abaster* (Risso, 1827)

II.2. Anatomy

Fish have a great anatomical diversity depending on their lifestyle, whether benthic (living near the bottom) or pelagic (living on the surface).

The brain, ears, and eyes are sensory organs whose anatomy can vary according to the environment and lifestyle **(**Kassem, 1987).

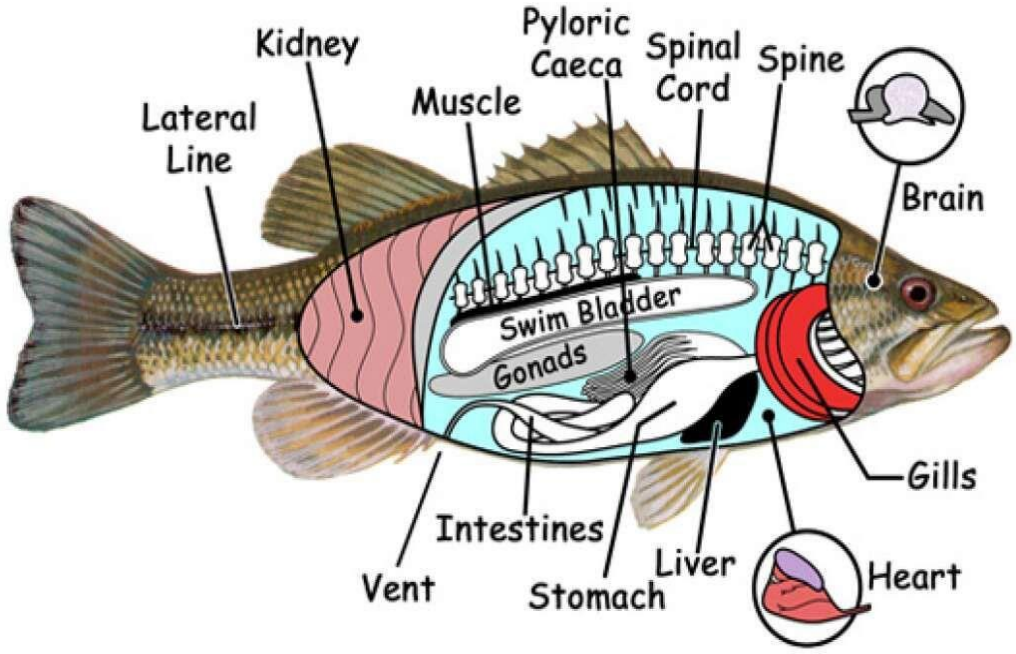

Figure 2: The anatomy of fish (Anonymous 2)

III. Freshwater Fish Biology

III.1. Diet

Some freshwater fish species are carnivorous and feed on small fish, crustaceans and other aquatic animals; some are herbivores and feed only on algae or aquatic plants; and others are omnivores and feed on both plants and animals (Lauzanne, 1988; Hangard-Vidaud *et al*., 1989).

III.2. Reproduction

Freshwater fish have adopted a variety of reproductive strategies to adapt to their environment. Some species practice external fertilization (called oviparous), where the eggs are fertilized in water after laying. Some use an ovoviviparous mode of reproduction, where the eggs develop and hatch inside the female's body. Other species are viviparous, the young develop completely inside the mother's body, nourished by a real placenta, this mode of reproduction is very rare in freshwater fish, but it is found in some shark species (Poinsot 2017).

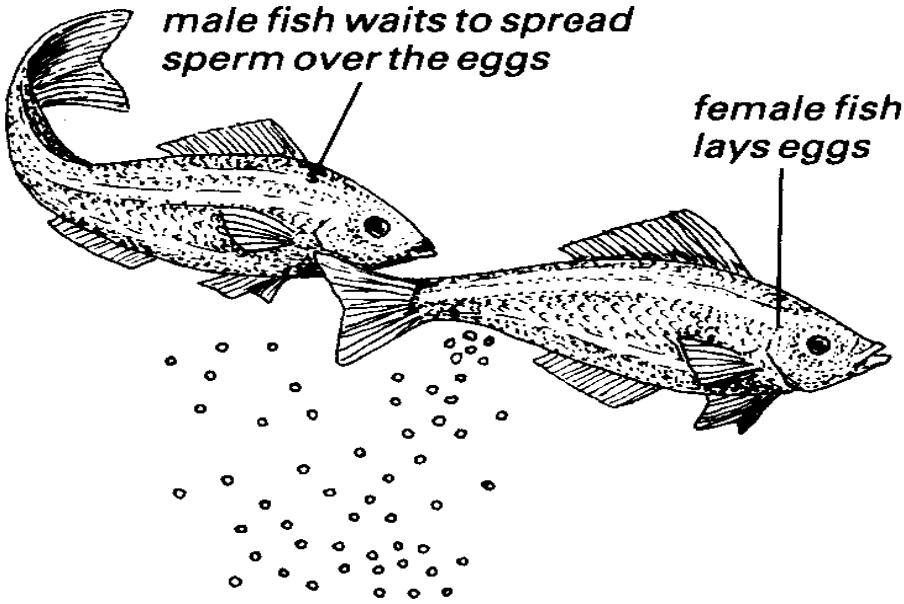

Figure 3: Reproduction in fish (Anonymous 3)

IV. Growth

The study of growth involves knowing the age of the fish or, if this is not possible, the average age of the current population (Do-Chi 1977).

The age of fish is estimated by directly reading various biological parts such as scales, otoliths or opercular bones (Fritsch, 2005).

Chapter 2 : Materials and Methods

I. Presentation of the study area

I.1. Presentation and location of Oued Lakhal

The Oued Lakhal dam fed by the Wadi Lakhal is located in the wilaya of Bouira, 5 km southeast of the city of Ain Bessam. The useful capacity of its reservoir is 30 hm3, which allows an annual regularization of 20 hm3. It is planned to be used to provide drinking and industrial water to the regions of Ain Bessam and Sour El-Ghozlane, as well as for the irrigation of the Arribs plains (fig.4) (Hamenni, Mesbah, and Semar, 2015).

I.2. Presentation and location of the Oued Isser

The Wadi Isser is located in northern Algeria. The study area is bounded by the daira of Drâa El Mizane to the northeast, by the wilaya of Bouira to the southeast, by the daïra of Ain Boucif to the south, by the daira of Ksar El Boukhari and the wilaya of Medea to the southwest, by the dairas of Tablat and Larbâa to the northwest and by the Mediterranean Sea to the northwest. The watershed of the Isser wadi covers an area of 4126 km2. It has a shape very close to a south-west/north-east quadrilateral (fig.4) (Houari and Zeggane, 2017)

I.3. Presentation and location of the Tilesdit dam

The TILESDIT dam is located in Bechloul, 18 km east of Bouira. its reservoir is intended to provide drinking water to the population of the wilaya of Bouira, and also irrigates the land in this region and neighbouring regions such as Bordj Bou Arreridj and M'sila (fig.4) (ANBT, 2015).

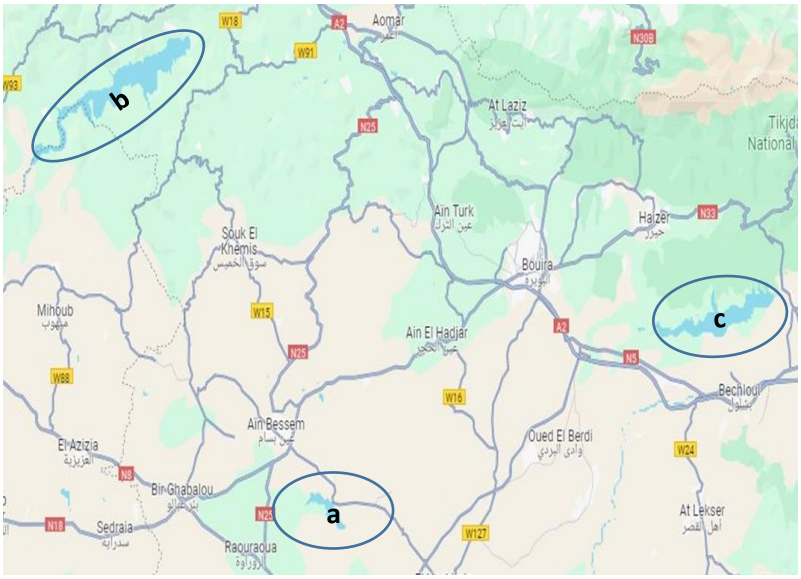

Figure 4: location of the three dams (Google map, 2024)

a: Barrage Oued Lakhel, b: Oued Isser, c: Barrage Tillesdit.

II. Sample Sampling and Processing

II.1. Sampling

The sampling was carried out between March and May 2024 by Bendiaf and Dahmani (Master 2 students in Biodiversity and Environment at the University of Bouira). The fish were caught randomly using a fishing rod and a fishing net.

II.2. Sample Identification

The identification of fish species was based on several criteria:

II.2.1. Body shape

The body shapes of fish vary according to their lifestyle. It is possible to arbitrarily classify them according to body elongation using the standard length-to-body height (L/H) ratio (Raskef and Tadje, 2023).

II.2.2. The head

Fish have eyes, nostrils, mouths, and gills with opercula on their heads, except for lampreys which have gill slits (Desroches and Picard 2017).

The different types of fish can be recognized by looking at two simple things: the size of their mouth (small, medium, or large) and where it is (top, tip, bottom, or that can move forward) (fig.7) (Teletchea, 2020).

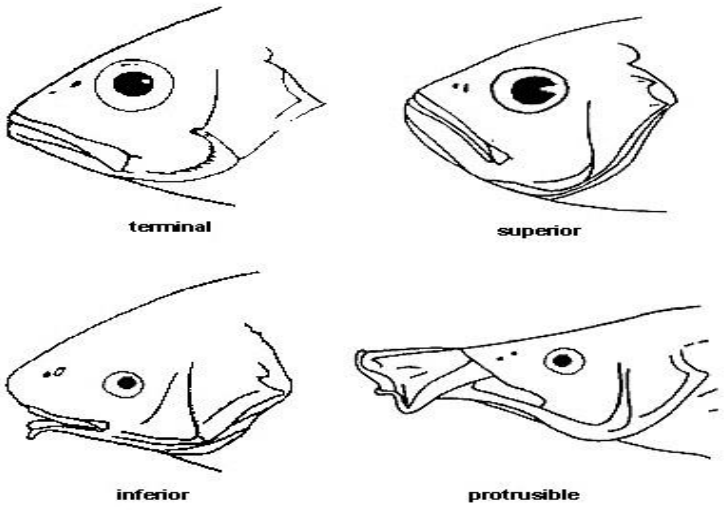

Figure 5: Different identification criteria present on the head (Hassan, 2013)

II.2.3. Color

Color plays a vital role in identification. This color can differ from one species to another, depending on the environment, the stage of development (juvenile, adult) and the sex (male or female). The markings of some species are: vertical or horizontal stripes on the body and spots of various sizes and colors on the operculum or on the flanks (Teletchea, 2020).

II.2.4. Fins

The fins help the fish to move. The place on the animal's body is an important characteristic for differentiating groups of fish of the same order (Raskef and Tadje, 2023). The fins of all fish are not identical, they are made up of combs grouped by a membrane that guarantees good absorption in the water. They can be even (pelvic, anal and pectoral) or odd (dorsal and caudal) (fig.8), formed by solid spiny rays and flexible and segmented soft rays (Desroches and Picard, 2017 and Boudjenane and Safa, 2019).

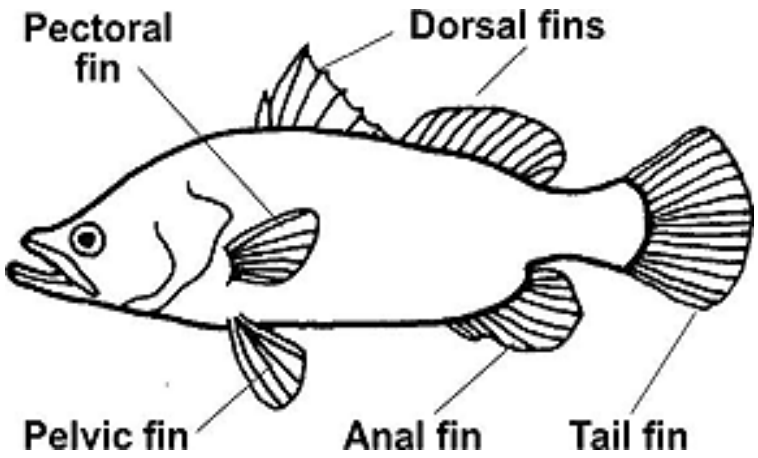

Figure 6: Anatomy of a fish (Desroches and Picard, 2017).

- ***Types and shape of fins:***

According to Desroches and Picard (2017), there are six types of fins in freshwater fishes:

- *The pectoral fins* are located behind the opercula, on the sides.
- *The pelvic fin* allows the fish to change its trajectory, to speed up or slow down, it plays a stabilizing role. It has three different positions (fig.09): either far behind the body (abdominal), or just behind the pectorals (thoracic), or in front of the pectorals (jugulars)

(Teletchea, 2020).

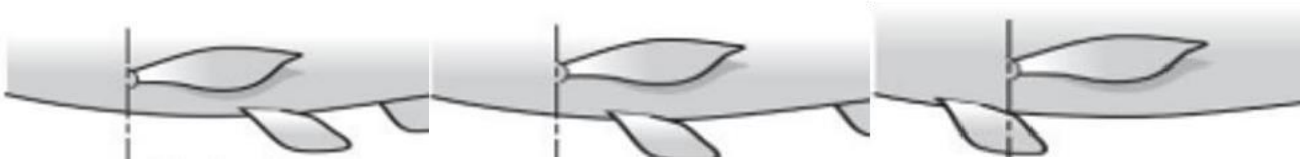

Figure 7 : Different pelvic fin positions (Teletchea, 2020).

- *The anal fin* is located just behind the cloaca, under the belly of the fish. It acts as a stabilizer like the keel of a ship.
- *The dorsal fin* is located on the back of the fish; it plays an essential role in stability. They can have soft, spiny rays or have both types of rays. Only the first ray or those of the anterior part of the fin are spiny in the latter case. They can be very far apart (separated), very close (juxtaposed) or glued together, which creates a long (fused) fin (fig.10) (Desroches and Picard, 2017).

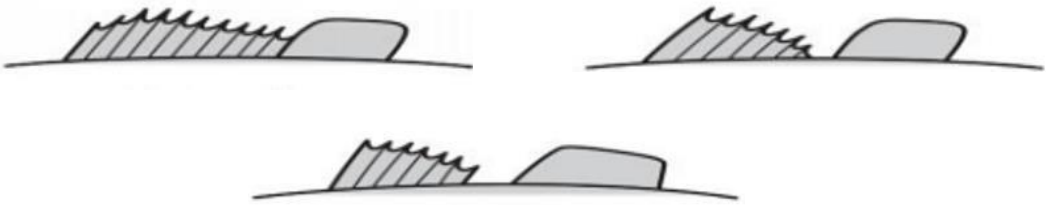

Figure 8 : Different dorsal fin shapes (Teletchea, 2020).

- *The adipose fin* is found on the back or caudal peduncle of the fish, between the dorsal fin and the caudal fin.
- *The caudal fin* is located at the end of the caudal peduncle, forming the tail of the fish. It is used for propulsion and, in some species, to move particles through the water to make the nest. The caudal fin has a variety of shapes, such as forked, indented, truncated, rounded, or even heterocercal, i.e. asymmetrical and with an upper lobe that extends well beyond the lower lobe (fig.11) (Desroches and Picard, 2017).

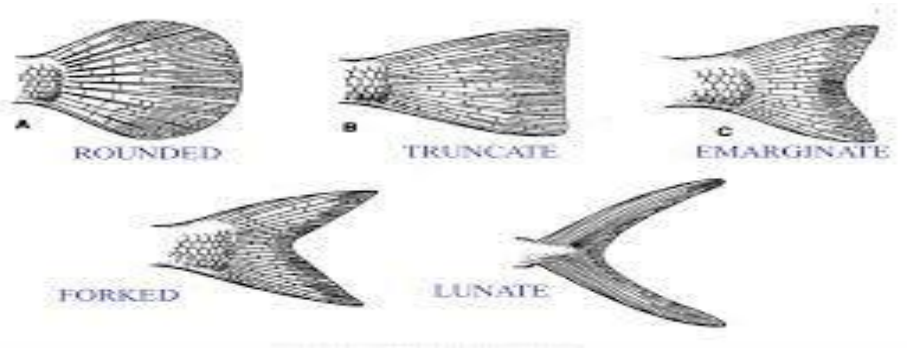

Figure 9 : The different shapes of caudal fins (Teletchea, 2020).

II.2.5. The lateral line

The lateral line is a tubular canal located under the scales and skin of fish (fig.12). It can be seen on the outside thanks to the series of pores into which it flows. Lateral line pressure allows fish to avoid obstacles or locate prey (Muus and Dahlstrome 1991).

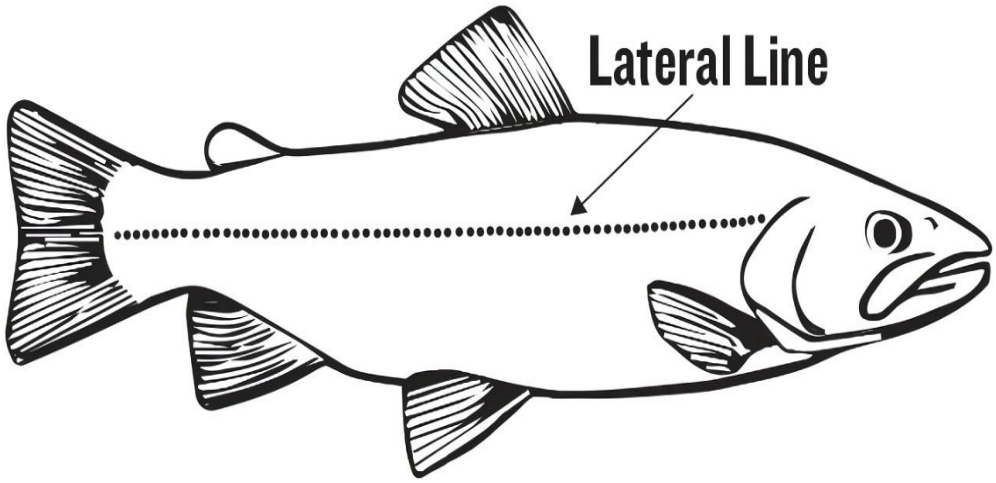

Figure 10 : The lateral line of the fish (Desroches and Picard 2017).

II.3. Sample Processing

All samples were measured to the nearest centimeter and weighed to the nearest milligram using a ruler and a 0.01g precision balance, respectively.

Lt: Total length, represents the distance between the tip of the mouth and the caudal fin.

Lf: Fork length, the length of the fish between the snout and the fork of the caudal fin.

Ls: Standard length, measured from the anterior end of the snout to the beginning of the caudal

fin.

Wt: total weight of the fish before dissection.

We: Eviscerated weight or weight of the empty fish.

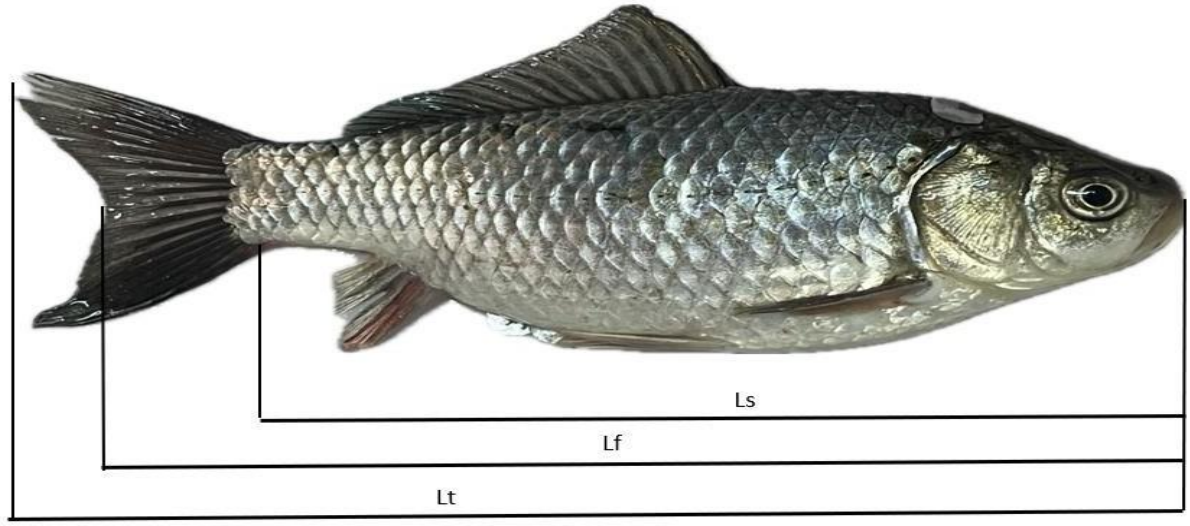

Figure 11 : Photograph representing different lengths measured.

II.4. Growth study

II.4.1. Age estimation

Two techniques were used to estimate age: scalimetry and otolithometry.

A- Scalimetry

The scales used were collected in the left laterodorsal part. It is in this region that scales appear earliest (Boët and Le Louarn, 1985). After collection, the scales were cleaned with water, rubbed between the fingers to remove mucus, and then examined under a magnifying glass to remove those that are reforming or changing in the centre (do-chi 1977).

- **Reading**

Age is often determined by measuring scales and observing the variations recorded in them. Dense areas, where growth is slow and narrow, follow one another with light areas, where growth is fast and wide. The two alternating zones represent a year in the life of the fish (fig.14). The scales are read using a binocular magnifying glass.

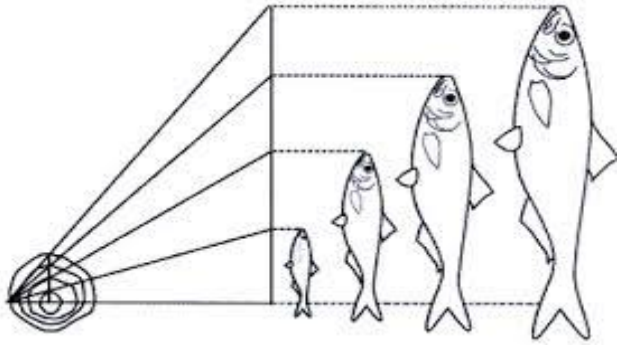

Figure 12 : fish scales (Morsi, 2016).

B- Otolithometry

Otolithometry is used to assess the age and growth of fish by examining their otoliths, which are small mineral structures found in the inner ear of fish. Otoliths are marked by visible microzonations that make it possible to determine the number of days (daily striations) or years (annual rings) that have elapsed since the conception of the fish (fig.15) (Loubens, G, 1978).

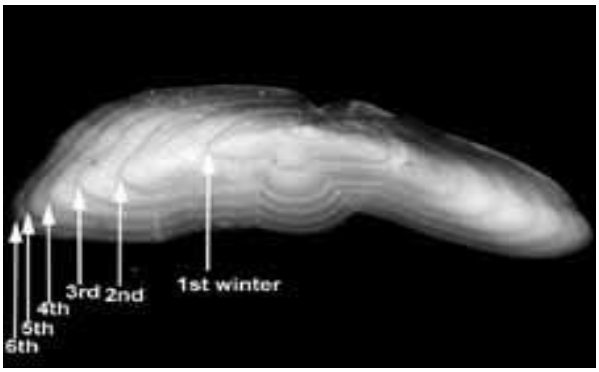

Figure 13: Otolith reading (Hardie and Hutchings 2011).

II.4.2. The Height-Weight Relationship

Allometry is a mathematical relationship that explains how the weight of a living being changes according to its size, thus making it possible to estimate one by knowing the other. This relationship is often represented by an equation (Bougis, 1976):

$$\mathbf{Wt = a\ L^b}$$

With:

Wt : total weight of the fish (g)

a : constant.

L : Total length (cm)

b : coefficient of allometry.

The type of growth is determined in terms of b:

b=3 : growth isometrics between weight and length.

b<3 : diminishing allometry (the cube of the length grows faster than the weight).

b>3 : major allometry (the weight grows faster than the cube of the length).

II.4.3. Fulton condition coefficient where the weight index

The Fulton condition coefficient is used to assess fish weight balance and growth rates (Morsi 2016). The standard condition coefficient is calculated by the following formula:

$$K = (We / Lt^3) \times 100$$

Where:

Ew: eviscerated weight;

Lt: the total length

The assessment of the condition factor was conducted globally and by separate sex based on the total length of the fish (Morsi 2016).

II.5. Study of reproduction

The reproduction of freshwater fish is an important topic that has been the subject of many studies.

II.5.1. Sex Determination

Sex determination is done directly after dissection. The poorly gonads are flattened and of a whitish coloration, and the female gonads are round with a pinkish coloration (fig.16) (Morsi, 2016).

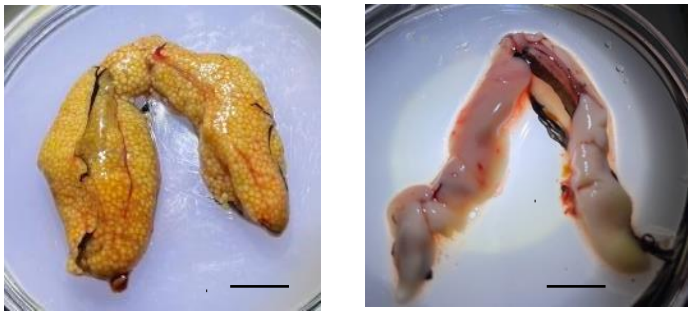

Figure 14 : Photograph of a female gonad (A) male gonad (B); scale bar: 1cm.

II.5.2. Sex ratio study

The proportion between the sexes is an important factor in ensuring the reproductive capacity of a species (Dermeche et *al*., 2009) The sex ratio simply indicates the distribution between the sexes. According to Lamrini (1983), the proportion of individuals of each sex in a given population is the ratio between the number of males and females:

SR=Nm/Nf

- Sex ratio: (Nm / Nm+Nf) × 100
- Femininity rate: (Nf / Nm+Nf) × 100
    - SR: Sex Ratio
    - Nm: number of males
    - Nf: number of females

II.5.3. The gonado-somatic relationship

To calculate the gonado-somatic ratio, it is essential to determine the reproductive period (Bougis, 1952). The latter can be considered as a real indicator of maturity (Lahaye, 1979). This ratio is different according to sex and age, and makes it possible to measure the increase in gonads during the sexual cycle (Hattour, 2000 and 2001; Roche *et al.* 2003). The RGS is calculated using the following expression (Bougis, 1952).

RGS = (Wg /We) x 100

Where:

Wg: weight of the gonads

Ew: eviscerated weight

Chapter 3 : Results and Discussion

I. fish identification

The sampling carried out in the Talesdit dam, Oued Isser and Oued lakhal, allowed us to identify 5 species of fish belonging to the Cyprinidae family.

Table 02 shows the size and weight (maximum and minimum) of these species. The *Cyprinus carpio* species is the largest, with a length of 55 cm, and has the highest weight (2 kg 500).

Table 2: Numbers, size and weight of fish species sampled.

cash	**Staff**	**Nm**	**Nf**	**Ni**	**Lt max** **Lt min (cm)**	**Pt max** **Min Pt (g)**
Carassius autarus	38	1	35	2	Max Lt: 24cm Lt min: 11 cm	Pt max :222 g Min Pt :20 g
Carassius carassius	9	2	7	0	Max Lt:22 cm Lt min: 11 cm	Max Pt :149 g Min Size:22 g
Cyprinus carpio	2	0	1	1	Max Lt :55 cm Min Lt : 14.2 cm	Max Size:2 kg 500 Min Size:40 g
Rutilus rutilus	1	0	0	1	Max Lt: 14.3cm	Max Pt :30.11 g
Bearded beards	1	0	1	0	Max Lt:17cm	Pt max :68 g
total	51	3	44	4		

Nm: number of males; Nf: number of females; Ni: indeterminate number; Max Lt: Maximum Total Length; Lt min: minimum total length; Max Pt: Maximum Total Weight; Min Ton: Minimum Total Weight

1. Golden crucian carp, *Carassius autarus* (Linnaeus, 1758)

Branching: Chordata

Class: Actinopterygii

Order: Cypriniformes

Superfamily: Cobitoidea

Family: Cyprinidae

Subfamily: Cyprininae

Genus: *Carassius*

Species : *Carassius autartus* (Linnaeus, 1758)

Figure 15 : Photograph of *C. autarus* ; scale bar: 3cm

- **Description**

The golden crucian is different from the Crucian Crucian Carp in that it has a light colour, a concave dorsal fin and more gill rakers (Bruslé and Quignard, 2001).

- **Ecology**

The golden crucian is a fish that lives in calm, stagnant or quiet waters. It likes warm places and does not need a lot of oxygen or very good quality water. It tolerates changes in its environment well (Bruslé and Quignard, 2001).

- **Diet**

This species feeds on zooplacton, molluscs, plants and mainly detritus (about 50% of its mass) (Bruslé and Quignard, 2001).

- **Reproduction**

Its sexual maturity is conditioned by a high temperature (24°C) and a prolonged period of sunlight (16 hours per day) (Bruslé and Quignard, 2001).

2. Common Carassius, *Carassius carassius* (Linnaeus 1758)

Reign Classification : Animalia

Branch : Vertebrata

Class : Ostechtyens

Order : Cypriniformes

Super family : Cobitoidea

Family : Cyprinidae

Subfamily : cyprininae

Genus : *Carassius*

Species : *Carassius Carassius* (Linnaeus 1758)

Figure 16 : Photograph of *C. carassius* ; scale bar: 3cm

- **Description**

The crucian carp has a very high and stocky head, compressed on the sides, it does not have barbels. It bears large scales, a high, convex dorsal fin, and a well-developed tail. Its pharyngeal teeth are well developed (Brusle and Quignard, 2001).

- **Ecology**

Crucian carp is a species of lake fish that lives in still water, warm or warm (it is sensitive to cold water). It is found on lake coasts, in shallow ponds, and in swamps (Martin *et al.* 1998).

- **Diets**

It feeds on plants and small benthic organisms, particularly chironomid larvae (Billard 1995).

- **Reproduction**

Males reach maturity at three years of age and females at four years of age. Its reproduction begins in spring, from April to June, at temperatures ranging from 15° to 19°C (Neveu, 2002; Kottelat and Freyhof, 2007).

3. Barbel, *Barbus barbus* (Linnaeus 1758)

Class: Teleosteens

Order: Cypriniformes

Family: Cyprinidae

Genus: *Barbus*

Species: *Barbus barbus* (Linnaeus 1758)

Figure 17 : Photograph of *B. barbus* ; scale bar: 3cm

- **Description**

Barbus is a genus with a fusiform body, cycloid scales, small eyes, mouth with thick and mobile lips, two pairs of barbels, hence the name barbel. In general, it has an integral lateral line and has denticulated or undenticulated pharyngeal bones (Aberkane and Iguer-Ouada 2011).

- **Ecology**

These are rheophilic and lithophilic species that favour gravel-bottomed watercourses. It becomes active mainly at night to feed, and sometimes during the day after a whirlpool (Bouhbouh, 2002).

- **Diet**

It feeds mainly on insect larvae and plant debris. The young (less than 13 cm) eat Dipteran and may fly larvae, mainly zoophagous larvae (Cherghou *et al*. 2002)

- **Reproduction**

It breeds from May to June until the beginning of July. During the first three years, the

height is normal and genus-independent (12-13cm), with dimorphism very marked sexual from 4-5 years old. At 10 years of age, females measure 40 cm and males 27 cm (Aberkane and Iguer-Ouada, 2011).

4. Common carp (Cyprinus *carpio)* (Linnaeus, 1758)

Reign : Animalia

Branch : Chordata

Class : Actinopterygii

Order : Cypriniformes

Super family : Cypriniformes

Family : Cyprinidae

Genus : *Cyprinus*

Species : *Cyprinus carpio* (Linnaeus 1758)

Figure 18 : Photograph of *C. carpio* ; scale bar: 5cm

- **Description**

Common carp can reach a maximum size of 150 cm and a weight of 35 kg. It has a moderately high body, protractile terminal mouth with 4 sensory barbels, no mouth teeth but pharyngeal teeth. It is covered with massive, well-established cycloid scales that cover the entire body except the head, and its dorsal fin is long and truncated (fig.20) (Brusle and Quignard, 2001).

- **Ecology**

Carp prefer warm or warm, stagnant (lakes, ponds, reservoirs) or slow (lower streams in the bream zone).

The carp is a gregarious and benthic species, which lives in the middle of the night and tends to be sedentary. It has a preference for low-light environments, with seasonal fluctuations. It is in search of wooded areas (Martin *et al*., 1998).

- **Diet**

Carp are omnivorous fish with a strong carnivorous tendency, with a wide variety of foods, and a preference for benthic foods (Michel and Oberdorff, 1995; Billard, 1997).

- **Reproduction**

The balance between the two sexes is favourable to females, with an increase in imbalance with age. For males, the age at first maturity is 2 years and for females 3 years (Billard 1995).

5. The Gardon, *Rutilus rutilus* (linnaeus 1758)

Reign: Animalia
Branch: Chordated
Sub-branch: Vertebrates
Super-class: Fish
Class: Actinopterygians
Order: Cypriniformes
Family: Cyprinidae
Genus: *Rutilus*
Species*: Rutilus rutilus* (Linnaeus 1758)

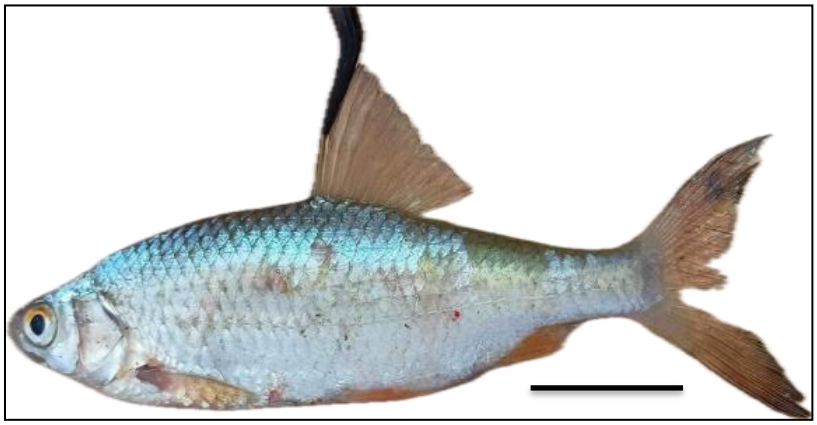

Figure 19 : Photograph of *R. rutilus* ; scale bar: 3cm

- **Description**

R. rutilus has a long, flattened body, it can measure up to 30 cm long with a weight of 400 g, or even 1 kg. It has a short caudal peduncle, a domed back and a rounded ventral edge between the pelvic fins and the anus (fig.21) (Kottelat and Freyhof, 1972).

- **Ecology**

R. rutilus prefers quiet places such as lakes, ponds and reservoirs, but it can also live in rivers. This species prefers temperatures between 28 and 30°C (Jacques and Jean-Pierre, 2013).

- **Diet**

The roach is an omnivorous species that consumes plankton. Its prey is very varied: algae, macrophytes, insects, arachnids, molluscs and amphibians (Kassi *et al*., 2018).

- **Reproduction**

The roach has a spring reproduction that lasts between April and July. Males mature sexually earlier than females (male: 2 to 3 years, females: 3 to 4 years) (Brusle and Quignard, 2001).

II. Growth Study Results

1. Age estimation

The age of the fish was estimated by both methods (scalimetry, otolithometry). The age of each species is mentioned in tables.

➢ **Age-Size Relationship of *C. carassius***

The results of the Age-Size relationship of the species *C. carassius* are reported in Table 3. We notice that ages 1 and 5 are the least represented, with a population of only 1 individual,

followed by the age of 3 years with 3 individuals and the age of 4 years which is the most represented with 4 individuals. We also note the absence of individuals who are 2 years old.

Khelifi et *al.* (2018) identified 7 age classes with heights ranging from 16 to 33 cm in the Beni Haroun Dam (Mila, Algeria).

Table 3: Age-Size Key of *C. carassius*

Height/age	**1**	**2**	**3**	**4**	**5**
[11,13[	1				
[13,15[			1		
[15,17[				1	
[17,19[			1		
[19,21[				2	
[21,23[			1	1	1

- **Age-Size Relationship of *C. autarus***

The results of the age-size relationship of the species *C. autarus* are reported in Table 4, we note the presence of 4 age classes where the age 4 years is the least represented, with 4 individuals, and the age of 2 years is the most represented with 15 individuals.

On the other hand, Boubouzal and Hamdous (2015) identified 4 age groups ranging from 2 to 5 years at the Taksebt dam (Tizi Ouzou), but the 3-year age class is the most represented.

Table 4: Age-Size Key of *C. autarus*

Height/age	1	2	3	4
[11,13[	7	6		
[13,15[	1	2	1	
[15,17[		3	1	
[17,19[		3	3	3
[19,21[	1	1	1	1
[21,23[			2	1
[23,25[			1	

- **Age-Size Relationship of *C. carpio***

The results of the age-size relationship of the species *C. carpio* show that the individual of size [14-15[has an age of 2 years and the individuals of tall [55-56[has an age of 5 years.

In the same species, Sahtout *et al.* (2017) observed six age groups ranging from 2 to 7 years in the Foum el-khanga dam, Souk-Ahras. In addition, the most predominant age groups are those of 2, 3 and 4 years old.

- **Age-Size Relationship of *R. rutilus***

Only one individual of *R. rutilus* that is between 14 and 15 cm long was captured, it is 2 years old.

According to the study by Arab (2021) in 3 Dams; Ghrib, Genitra and Sekak, the age of two years is the most common with sizes of 16-17 cm, 13-14 cm and 14-16 cm respectively.

- **Age-Size Relationship of *B. barbus***

Only one individual of *B. barbus* that is between 17 and 18 cm long was captured, it is 1-year-old.

On the other hand (Kraiem, 1842), he observed 5 age classes with dimensions ranging from 11 to 20 cm at Oued Ghezala (Tunisia).

2. The Height-Weight Relationship

➢ The size-weight relationship of the *Carassius carassius species*

The results of the species' height-weight relationship *Carassius carassius* are reported in the following figure:

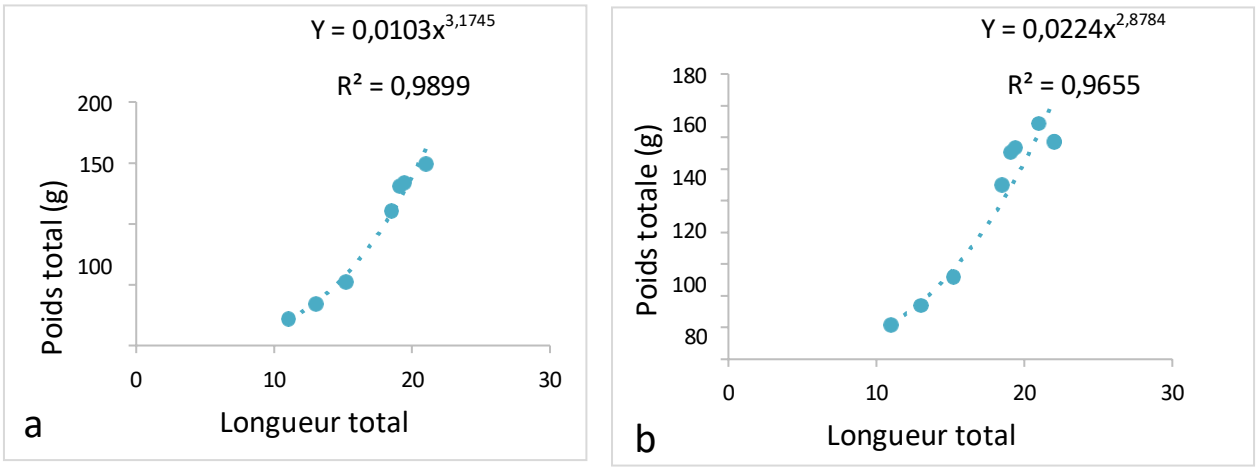

Figure 20 : Size-weight relationship of individuals of the species *Carassius carassius*.

a: females, b: the entire sample.

The value of the allometry coefficient (b) of the size-weight relationship for females is greater than 3 (b= 3.1745), which means an increasing allometry, so the weight increases faster than the length.

The value of the allometry coefficient (b) of the height-weight relationship for the whole sample is less than 3 (b=2.8784), so there is a diminishing allometry between the two variables, the weight increases less quickly than the length.

The value of the correlation coefficient between total length and total weight in all individuals of *Carassius carassius* is close to 1, (R^2 = 0.9899), (R^2=0.9655). This indicates a good correlation between the two variables.

Khelifi *et al*. (2018), that males, females and the entire sample have a higher allometry, with an allometry coefficient greater than 3, a correlation coefficient close to 1, which gives a strong correlation.

➢ The size-weight relationship of the species *Carassius autarus*

The results of the size-weight relationship of the species *Carassius autarus* are reported in the following figure:

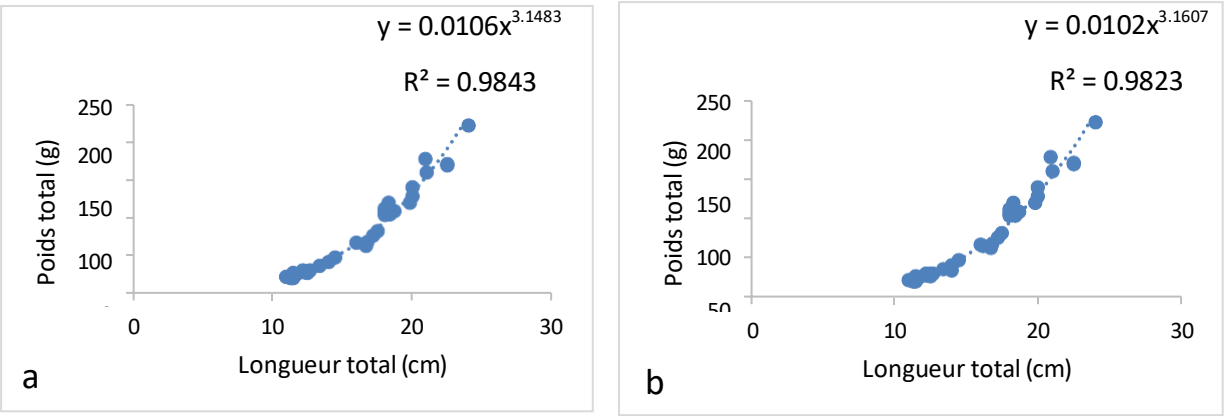

Figure 21 : Size-weight relationship of individuals of the species *Carassius autarus.*

a: females, b: the entire sample.

The value of the allometry coefficient (b) of the size-weight relationship for females and the whole sample is greater than 3 (b_a=3.1483 and b_b=3.1607 respectively), which means an increasing allometry, weight increases faster than length.

The value of the correlation coefficient between total length and total weight in all individuals of *Carassius autarus* is close to 1 (R^2 = 9843 for females and R^2=9823 for all individuals), which indicates a strong correlation between the two variables.

Similarly, Boubouzal and Hamdous (2015) obtained a value of b = 3.25 in the Taksebt dam in Tizi Ouzou for all individuals, and a correlation coefficient close to 1 (R^2 = 0.966).

- ***Note: Due to the presence of only one and two individuals in the species of C. carpio, R. rutilus and B. barbus, the size-weight relationship was not calculated***.

3.Condition Factor K

Figure 24 shows the evolution of the condition coefficient K as a function of the sampling date; In *C. autarus*, we see an increase in K values on 14/04/2024 (K=9.30) but it decreases to reach its minimum on 16/04/2024 (K=3.34). Then it increases gradually during the period from 16/04/2024 to 20/04/2024 (K=32.08). In *C. carassius*, the K shows a slight increase from 2.40 until it reaches its maximum (6.27) on 20/04/2024.

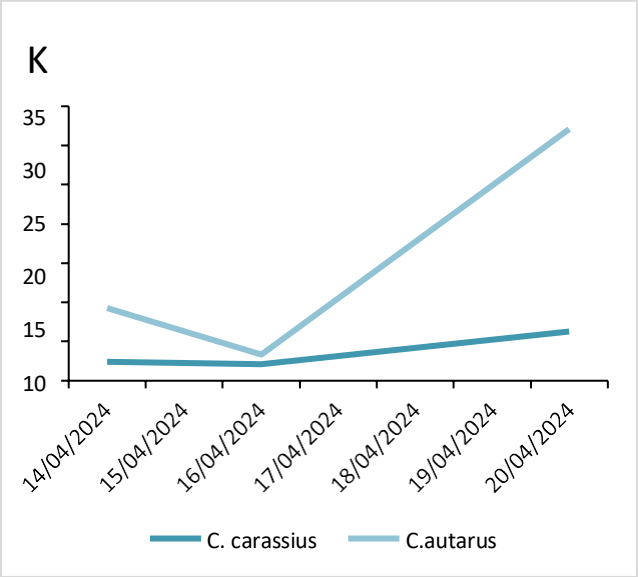

Figure 22 : The K-condition coefficient of *C. carassius* and *C. autarus* species.

Boubouzal and Hamdous (2015) and Khelifi *et al.* (2018) reported a condition coefficient K of less than 1 in *C. autarus* and *C. carassius* sampled between April and June.

III.Results of the reproduction study

1. Sex ratio (SR) study

Figure 25 and Table 8 show that the sex ratio is in favor of females for all the species studied due to high rates of femininity. The species *R. rutilus*, the sex ratio is not studied since the only individual captured has an indeterminate sex.

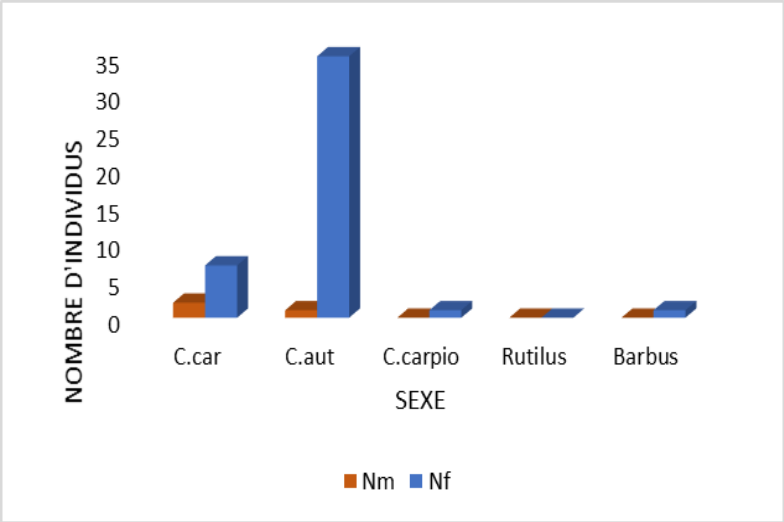

Figure 23 : Histogram representing the sex ratio according to species.

Table 5: Sex ratio rate between males and females of the 5 species

cash	Sex ratio	Sex ratio	Femininity rate
C. carassius	0,28571429	22,22222222	77,77777778
C.autarus	0,02857143	2,777777778	97,22222222
C.carpio	0	0	100
Bearded B.	0	0	100

In contrast to the sex ratio obtained by Belhadef and Berdamane (2020) in *C. carassius* at the Ain Zada dam in Bordj Bou Arreridj, which is higher than the rate of femininity. Boubouzal and Hamdous (2015) in the Taksebt Dam (Tizi Ouzou), reported a slightly predominant femininity rate compared to the sex rates among *C. autarus.*

2. The gonado-somatic relationship

Figure 26 shows the variations in the RGS per day of sampling. We can observe that in *C. carrasius*, the RGS is increasing and reaches its maximum on 20/04/2024 (RGS=21.45). In *C. autarus* the maximum RGS value is 27.29 recorded on 16/04/2024, then there is a slight decrease to the value of 20.74 on 20/04/2024.

These increasing values may indicate that both (2) species are in the breeding season, and that the peak of RGS in *C. autarus* may co-occur with the egg-laying period.

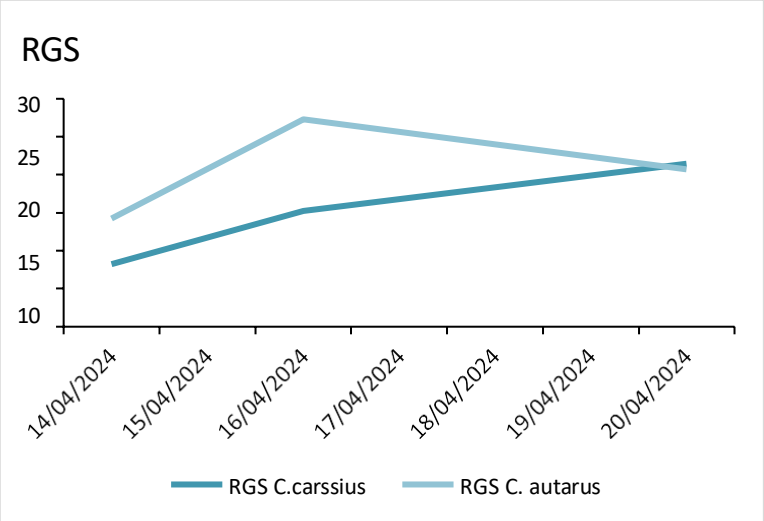

Figure 24 : the gonado-somatic ratio in *C. carrasius* and *C. autarus.*

Khélifi (2018), reported that reproduction is most marked in March and May in the Hammam Debagh dam, which is similar to our results. It seems that different physical and biotic factors influence egg-laying; The duration and timing of egg-laying are closely related to temperature variation and the period of photophase (Pajuelo and Lorenzo, 2000; Ouannes Ghorbel *et al*, 2002; Mouine *et al*, 2007).

Conclusion

Conclusion

During the present study we identified five (5) species belonging to the Cyprinidae family: The Crucian (*Carassius carassius*), the Crucian (*Carassius autarus*), the Common Carp (*Cyprinus carpio*), the Garbon (*Rutilus rutilus*) and the Barbel (*Barbus barbus*).

Our results of age estimation, 5 classes were recorded in *C. carassius* and *C. carpio*, 4 in *C. autarus*, 2 classes in *R. rutilus* and 1 class in B. barbus.

The study of the size/weight relationship showed a decreasing allometry in the species *C. carassius* and a majoring allometry in the species *C. autarus*. The correlation coefficient R2 is close to 1 in all species, which reflects a strong correlation between total length and total weight.

The condition factor K is greater than 1 in all species, which means that the environmental conditions are favourable overall. It is important to note that K values greater than 1 indicate healthy and healthy fish.

In *Carassius carassius* and *Carassius autarus*, the sex ratio is in favor of females over males.

The monthly evolution of gonado-somatic ratios in both species (*C. carassius* and *C. autarus*) shows that both species have a reproductive period

Prospects

- Sample selection should be over a long period of time and the number of samples should be high.

- Samples must be taken from deferential areas to obtain different species.

- Conduct research to estimate the age of fish.

Bibliographic references

Aberkane, B., & Iguer-Ouada, M. (2011). Étude de la reproduction du Barbeu (Barbus barbus callensis). *Éditions Universitaires Européenes, France*.

ANBT. (2015). Agence Nationale des Barrages et Transferts : Fiche technique du barrage Tilesdit.

Almaça, C. (1969). Révision critique des quelques types de Cyprinidés d'Europe et d'Afrique du Nord des collections du Muséum d'Histoire Naturelle. *Bull. Mus. natl. Hist. nat., Paris*, *40*(6), 1968.

Arab, I. Y. (2021). *Statut écologique du Cyprinidé invasif Rutilus rutilus (Linnaeus, 1758) en Algérie* (Doctoral dissertation).

Attal, M. et Arab, A., (2013). Estimation de la croissance de la population de Cyprinuscarpio(Poisson Cyprinidae) du barrage de Ghrib (W. Ain Defla). USTHB- FBS - 4th International Congress of the Populations & Animal communities "Dynamics & Biodiversity of the terrestrial & Aquatic Ecosystems""CIPCA4"TAGHIT (Bechar) – ALGERIA, 19- 21 November, 2013. P.

Baali, A., Belhsen, O. K., Ouazzani, K. C., Amenzoui, K., & Yahyaoui, A. (2021). Age, growth and ovarian histology of Sardinella aurita (Valenciennes, 1847) in the south of Atlantic Moroccan coast. *Turkish Journal of Fisheries and Aquatic Sciences*, *21*(4), 191-204.

Baroiller, J. F. (1998). Le déterminisme environnemental du sexe chez les poissons gonochoriques. *La Pisciculture Française*, *133*, 51-59.

Billard, R. (1997). Les poissons d'eau douce des rivières de France. *Identification, inventaire et répartition des*, *83*, 192.

Boubouzal, Y., & Hamdous, L. (2015). *Inventaire de l'ichtyofaune des eaux continentales d'Algérie et étude de la morphométrie et de la croissance du carassin Carassius auratus Linnaeus, 1758 du barrage de Taksebt (Tizi Ouzou)* (Doctoral dissertation, Université Mouloud Mammeri).

Boudjenane, I., & Safa, I. (2019). *Inventaire et morphologie des poissons d'eaux douces de la région de Tiaret (Cas de Saous et Ain Tides)* (Doctoral dissertation, université ibn khaldoun-tiaret).

Bouhadad, R. (1993). Distribution des espèces du genre Barbus en Algérie. *Cah. Ethol*, *13*, 185-188.

Bouhadad, R., & Asselah, B. (1998). Biodiversité comparée de l'ichtyofaune des eaux douces algériennes (Sahara et Nord) et maghrébine. *Santé plus*, *61*, 19-22.

Bougis, P. (1976). Oceanographie biologique appliquee; l'exploitation de la vie marine.

Bibliographic References

Boet, P., & Le Louarn, H. (1985). La croissance du poisson. Techniques d'étude. *Gestion piscicole des lacs et retenues artificielles*, 125-142.

Brahmia, S. (2016). *Ecologie parasitaire des Cyprinidés du lac Oubeira (Nord-Est Algérien)* (Doctoral dissertation, Thèse de doctorat, Université Badji Mokhtar, Annaba).

Bruslé, J., & Quignard, J. P. (2001). *Biologie des poissons d'eau douce européens*. Lavoisier.

Cauvet, G. (1930). Bulletin des travaux publiés par la station d'aquaculture et de pêche de Castiglione : 1 : 21-73.

Cherghou, S., Khodari, M., Yaâkoubi, F., Benabid, M., & Badri, A. (2002). Contribution à l'étude du régime alimentaire du barbeau (Barbus barbus callensis Valenciennes, 1842) d'un cours d'eau du Moyen-Atlas (Maroc) : Oued Boufekrane. *REVUE DES SCIENCES DE L'EAU*, *15*(1), 153-164.

Desroches, J. F., & Picard, I. (2017). *Poissons d'eau douce du Québec et des Maritimes*. Éditions Michel Quintin.

Dermeche, S., Chahrour, F., & Boutiba, Z. (2009). Contribution à L'étude Des variations Des Indices Physiologiques (Indice de Réplétion-Indice Gonadique et Sex Ratio) Chez la Population D'oursins Comestibles Paracentrotus Lividus (Lamarck 1816) Du Littoral Occidental Algérien. *European Journal of Scientific Research*, *30*(1), 153-163.

Doadrio, I. (1994). Freshwater fish fauna of North Africa and its biogeography. *Ann Musee Roy Afr Centr Ser*, *8*, 21-34.

Dieuzeide, R., & Champagne, R. (1950). L'able de la Calle (Phoxinellus callensis Guichenot). *Bull. Stn. Aquic. Pêche Castiglione*, *2*, 9-28.

Dieuzeide, R., & Rolland, J. (1951). Le laboratoire d'hydrobiologie et de pisciculture d'eau douce du Mazafran. *Bull Stat Aquic Pêche Castiglione*, *3*, 190-207.

Do-Chi, T. (1977). Détermination statistique de l'âge : Quelques méthodes de décomposition d'un échantillon en composantes Gaussiennes. *Océanis, V., fac*, *10*, 503-530.

Hachour, K. (2017). *Contribution à la connaissance des poissons d'eau douce de Kabylie* (Doctoral dissertation, Université Mouloud Mammeri).

Hamenni, N., Mesbah, M., Et Semar, A. (2015). Etude des ressources en eau dans le bassin versant, recherche agronomique n° 27.

Hangard-Vidaud, N., Nicolas, J. A., Bosgiraud, C., & Cornuejols, M. J. (1989). Recherche de Listeria chez les poissons d'eau douce. *MAN Microbiologie, aliments, nutrition*, *7*(4), 421-423.

Hardie, D. C., & Hutchings, J. A. (2011). The ecology of Atlantic cod (Gadus morhua) in Canadian Arctic lakes. *Arctic*, 137-150.

Bibliographic References

Hassan, A. (2013). Anatomy and histology of the digestive system of the carnivorous fish, the brown-spotted grouper, Epinephelus chlorostigma (Pisces; Serranidae) from the Red Sea. *Life Science Journal*, *10*(2), 1-16.

Hattour, A. (2000). *Contribution à l'étude des poissons pélagiques des eaux tunisiennes* (Master's thesis).

Hattour, A. (2001). Analyse de l'indice gonadosomatique du thon rouge (Thunnus thynnus) capturé par les senneurs tunisiens. *Collect. Vol. Sci. Pap. ICCAT*, *55*(1), 232-237.

Houari, Zeggane. (2017). Étude de comportement hydrologique des cours d'eau en Algérie, cas du bassin versant Isser, Algérie (Doctoral dissertation).

Kassi, G. B., Zeré, M. G., Stanislas, S. Y., & N'douba, V. (2018). Régime alimentaire de Ctenopoma petherici (Perciformes, Anabantidae) dans la rivière Agnéby et dans le lac de barrage hydroélectrique d'Ayamé 2 (Côte d'Ivoire). *Tropicultura*.

Kassem, M. (1987). *Anatomie comparee de l'encephale et des organes des sens chez les poissons Teleosteens du sous-ordre des Gobioidei* (Doctoral dissertation, Paris 7).

Khelifi, N., Boucenna, I., Boualleg, C., Kaouachi, N., Sahtout, F., & Bensouillah, M. (2018). Etude De La Croissance Du Carassin Commun Carassius Carassius (Linnaeus, 1758) du barrage beni haroun (Mila, Algérie). Bulletin de la Société zoologique de France , 143 (4), 213-226.

Khélifi, N. (2018). *Etude de la biologie du Carassin (Carassuis carassuis) dans les barrages Béni-Haroun (Mila) et Ain El Dalia (Souk-Ahras)* (Doctoral dissertation, Thèse de Doctorat 3eme cycle. Université Souk Ahras–Algérie).

Kraiem, m. M. (1842). Etude comparée de la croissance de différentes populations de barbus callensis valenciennes.

Kottelat, M., & Freyhof, J. (2007). *Handbook of European freshwater fishes* (Vol. 13). Cornol, Switzerland : Publications Kottelat.

Lahaye, J. (1980). Les cycles sexuels chez les poissons marins. *Oceanis*, *6*(7), 637-654.

Lamrini, A. (1983). *Les Sparidae du plateau continental saharien du Sud Marocain : reproduction, croissance et alimentation de Pagellus Acarna (Risso, 1826) et Pagellus Coupei (Dieuzeide, 1960)* (Doctoral dissertation, Thèse doctorat. Maroc. 29p).

Lauzanne, L. (1988). Les habitudes alimentaires des poissons d'eau douce africains (Feedings habits of African freshwater fishes). *Biol. écologie des Poisson. D'eau douce africains—Biol. Ecol. african Freshw. fishes*, 221-242.

Lee, R. M. (1920). *A review of the methods of age and growth determination in fishes by means of scales*. HM Stationery Office.

Bibliographic References

Losange. (1999). Poissons d'eau douce. Ed. Artémis pour la présente édition. P 15.

Loubens, g. (1978). Biologie de quelques especes de poisson du lagon neo-caledonien. I: determination de l'age (otolithometrie).

Lounaci, D. D. (2012). Les poissons d‟ eau douce d‟ Algérie : Inventaire et répartition. *Actes du 13ème Congrès Franco-Maghrebain de Zoologie et d" Ichthyologie. Marrakech, Maroc*, 6-10.

Lounaci-Daoudi, D., Lounaci, A., & Arab, A. (2016). Freshwater fish fauna of Algeria. The fish fauna of inland waters of Great-Kabylia. *Advances in Environmental Biology*, *10*(12), 74-84.

Martin, M., Goubier, V., Kokkidis, M. J., & Exbrayat, J. M. (1997). Comparative evolution of the ovary maturation of black-bass [Micropterus salmoides] according to the water temperature. *Polskie Archiwum Hydrobiologii*, *44*(1-2).

MORSI, A. (2016). *Ecologie du barbeau de l'Algérie, Luciobarbus callensis (Valenciennes, 1842) (Cyprinidae) dans Oued El-Harrach et de ses affluents (nord de l'Algérie)* (Doctoral dissertation, ENSA).

Mouine, N., Francour, P., Ktari, M. H., & Chakroun-Marzouk, N. (2007). The reproductive biology of Diplodus sargus sargus in the Gulf of Tunis (central Mediterranean). *Scientia marina*, *71*(3), 461-469.

Mimeche, F., Biche, M., Ruiz-Navarro, A., & Oliva-Paterna, F. J. (2013). The population structure, age and growth of Luciobarbus callensis (Cyprinidae) in a man-made lake in the Maghreb (NE Algeria). *Limnetica*, *32*(2), 391-404.

Mimeche, F. Belhamra, M et Mimeche, H. (2015). Growth parameters of Cyprinuscarpiolinnaeus, 1758 (Cyprinidae) in the K'Sob reservoir in M'sila (Algeria). Croissance de Cyprinuscarpiolinnaeus, 1758 (Cyprinidae) dans le barrage el K'sob dans la Wilaya de M'sila (Algérie). Courrier du Savoi – N°19, p. 59- 64.

Muus, B. J., Dahlström, P., & Bovet, P. (1988). Guide des poissons de mer et pêche : biologie, pêche, importance économique. *(No Title)*.

Niaré, t. (1994). 3.2 croissance des poissons. *La pêche dans le delta central du niger: approche pluridisciplinaire d'un système de production halieutique*, *1*, 229.

Omar, y. (2015). Bioaccumulation de quelques métaux lours (pb, zn et cu) d'origine routière au moyen d'une mousse (bryum argenteumhedw) dans la ville de tiaret (algérie) : classe de pollution cartograohie. Thèse de doctorat en sciences de l'environnement. Université djilali liabes, sidi bel abbes, algérie. 121pp.

Bibliographic References

Ould Mokhtar, R. (2020). *Caractérisation des extraits issus de Papaver Rhoeas et valorisation potentielle de ces extraits dans des applications tinctoriales* (Doctoral dissertation, université ibn khaldoun-tiaret).

Panfili, J., de Pontual, H., Troadec, H., & Wright, P. J. (2002). *Manual of fish sclerochronology* (pp. 464-p+). Ifremer-IRD coedition.

Penczak, T., & Moliński, M. (1984). Fish production in Oued Sebaou, a seasonal river in North Algeria. *Journal of Fish Biology*, *25*(6), 723-732.

Phillipart J. C. (1971). Age et croissance de la vandroise, leuciscus leuciscus (l) dans l'outre et lala berwine. Ann soc. Roy. Zoo. Belgique. Fas 1-2.

Poinsot, M. (2017). « Demeurer un musée de l'histoire de l'immigration et devenir un musée des migrants ». Entretien avec Benjamin Stora, président du Conseil d'orientation de l'EPPPD du Palais de la Porte Dorée-Musée national de l'histoire de l'immigration-Aquarium tropical. *Hommes & migrations. Revue française de référence sur les dynamiques migratoires*, (1319), 6-8.

Racha, B., & Boufekane Chayma, M. S. (2022). Contribution à l'étude de la biologie du Carassin commun carassius carassius (Linnaeus 1758) dans le barrage de Hammam Debagh Guelma.

Raskef, A., & Tadje, A. (2023). *Etude morphologique et distribution de la faune Ichtyologique de la région de Tiaret* (Doctoral dissertation, Université Ibn Khaldoun).

Ramade, F. (2003). *Éléments d'écologie : cours. Écologie fondamentale*. Dunod.

Razani, H., & Hanyu, I. (1986). Effects of continued short photoperiod at warm temperature and following changes of regimes on gonadal maturation of goldfish [Carassius auratus]. *Bulletin of the Japanese Society of Scientific Fisheries (Japan)*, *52*(12).

Sahtout, F., Boualleg, C., Khelifi, N., Kaouachi, N., Boufekane, B., Brahmia, S., ... & Bensouilah, M. (2017). Study of some biological parameters of Cyprinus carpio from Foum El-khanga Dam, Souk-Ahras, Algeria. *Aquaculture, Aquarium, Conservation & Legislation*, *10*(4), 663-674.

Teletchea, F. (2020). *Guide des poissons de France : cours d'eau, lacs et étangs*. Belin Editeur.

Vu B. (2008). Récupérer les eaux de pluie. Edition Eyrrolles, France, 88p.

Zidane, M. (2019). Apport de la télédétection et des SIG pour le suivi de la qualité physico-chimique des eaux du Barrage Tilesdit dans la wilaya de Bouira. Mémoires de Master. Université de Bouira.

Bibliographic References

Webography reference :

Anonyme 1 : www.flylordsmag.com

Anonyme 2: www.aquatendance.free.fr

Anonyme 3: www.jonathansclassroom.com

Anonyme 4 : www.futura-sciences.com

Anonyme 5 : www.dfo-mpo.gc.ca

Abstract

During this work we studied the Algerian freshwater fish inhabiting the Tilesdit dam (Bechloul), Oued Lakhel dam (Ain Bessam) and Isseer dam (Lakhdaria) during the period of March and May. By determining the species, age, growth and reproduction of 51 individuals. We identified five species (*Carassius carassius*, *Carassius autarus*, *Cyprinus carpio*, *Rutilus rutilus* and *Barbus barbus*). The age of the fish varies between 1 year and 5 years for sizes ranging from 11 to 55cm. The study of the size/weight relationship showed menirante allometry in *C. carassius* and majorante allometry in *C. autarus*. The condition factor K is greater than 1 in all species this result means that the environmental conditions are favorable overall. The sex ratio in *C. carassius* and *C. autarus* favours females over males. Increasing RGS values may indicate that both (2) species are in the breeding season and that the RGS peak in *C. autarus* may coincide with the laying period.

Key words: Tilesdit dam, Oued Lakhal dam, Oued Isser, growth, reproduction.

Résumé

Durant ce travail nous avons étudié les poissons d'eau douce algériens peuplant le barrage Tilesdit (Bechloul), barrage Oued Lakhel (Ain Bessam) et barrage Isseer (Lakhdaria) durant la période du mars et mai. En déterminant l'espèce, l'âge, la croissance et la reproduction de 51 individus. Nous avons identifié cinq espèces (*Carassius carassius*, *Carassius autarus*, *Cyprinus carpio*, *Rutilus rutilus* et *Barbus barbus*). L'âge des poissons varie entre 1 an et 5 ans pour les tailles allant de 11 à 55cm. L'étude de la relation taille/poids a montré une allométrie ménirante chez l'espèce *C. carassius* et une allométrie majorante chez l'espèce *C. autarus*. Le facteur de condition K est supérieur à 1 chez toutes les espèces ce résultat signifie que les conditions environnementales sont favorables dans l'ensemble. La sex-ratio chez *C. carassius* et *C. autarus* est en faveur des femelles par rapport aux males. Les valeurs croissantes de RGS peuvent indiquer que les deux (2) espèces sont en saison de reproduction et que le pic de RGS chez *C. auratus* peut coïncider avec la période de ponte.

Les mots clés: Le barrage de Tilesdit, le barrage de Oued Lakhal, Oued Isser, croissance, reproduction.

ملخص

خلال هذا العمل درسنا أسماك المياه العذبة الجزائرية التي تسكن سد تيليسديت (بشلول) وسد واد لخيل (عين بسام) وسد إيسير (الأخضرية) (*Carassius carassius*و *Carassius* خلال فترة مارس ومايو. من خلال تحديد الأنواع والعمر والنمو والتكاثر لـ 51 فردًا. حددنا خمسة أنواع يتراوح عمر الأسماك بين 1 سنوات و5 سنوات لأحجام تتراوح من 11 .(Barbus *barbus*و *Rutilus rutilus*و *Cyprinus carpio*و *autarus* عامل الحالة .*C. autarus* في majorante allomtryو *C. carassius* إلى 55 سم. أظهرت دراسة علاقة الحجم/الوزن قياس ألومتري مينيرانت في تفضل الإناث على *C. autarus* و *C. carassius* أكبر من 1 في جميع الأنواع وهذا يعني أن الظروف البيئية مواتية بشكل عام. نسبة الجنس في K .قد تتزامن مع فترة التكاثر C. autarus في RGS المتزايدة إلى أن كلا النوعين (2) في موسم التكاثر وأن ذروة RGS الذكور. قد تشير قيم

الكلمات المفتاحية: سد تيليسديت، سد واد لكحل، واد إيسر، النمو، التكاثر